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# **The Danish IPIP-NEO-120: A free, validated five-factor measure of personality**

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## **Abstract**

This paper reports the results of a translation and validation of a Danish-language version of the IPIP-NEO-120 constructed by Johnson (2014). The IPIP-NEO-120 is a public domain 120-item inventory that measures personality constructs similar to those in the Revised NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1992). The inventory was developed to provide researchers with a free inventory with a shorter format than the earlier 300-item IPIP-NEO (Goldberg, 1999) and hence enable more researchers to include a personality measure in their research. The validation study reported in this paper was conducted to expand the IPIP-NEO-120 into the Danish context and provide Danish researchers with a free, validated personality measure based on the Five-Factor Model directly applicable to cross-national research. The psychometric properties of the Danish IPIP-NEO-120 were tested in a sample of veterinary students and graduates ( $N = 525$ ) from a Danish university. The factor structure, internal consistency, and factor intercorrelations obtained in the Danish sample closely resembled those obtained in Johnson's validation of the original IPIP-NEO-120, and the results indicate that the Danish measure corresponds well to the English-language original.

*Keywords:* FFM; IPIP-NEO-120; personality; test translation; validation

## 1. Introduction

Personality assessment is widely used in modern personality research. However, since commercial publishers own most of the personality inventories typically used in research, researchers have generally had to spend a substantial amount of their funding on personality questionnaires. According to Goldberg (1999), the financial, copyright, and permission issues associated with this practice have hindered the progress within personality research, and this was partly why he initiated the creation of the International Personality Item Pool, in short the IPIP (Goldberg, 1999; Goldberg et al., 2006). The IPIP is a public domain resource consisting of thousands of individual personality items and hundreds of scales constructed using subsets of these items, all freely accessible from the IPIP website (<http://ipip.ori.org>). Some of the constructed IPIP scales were specifically designed to correspond to scales in commercial inventories to provide a free alternative to these. One such scale is the IPIP-NEO-120 constructed by Johnson (2014); a personality inventory designed to measure the same personality dimensions and facets as the Revised NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1992). As the NEO-PI-R, the IPIP-NEO-120 measures the personality dimensions of the Five-Factor Model (FFM); Neuroticism, Extraversion, Openness (to experience), Agreeableness, and Conscientiousness, as well as the 30 facets subsumed under these broad dimensions. The present paper reports a translation and validation of the Danish version of the IPIP-NEO-120.

The IPIP-NEO-120 was constructed from a subset of items of the 300-item IPIP-NEO by Goldberg (1999). Given the substantial length of the IPIP-NEO, this inventory may be too cumbersome for many research purposes, and Johnson (2014) therefore constructed a shorter version consisting of 120 items; the IPIP-NEO-120. Johnson wished to retain scales for both the five FFM dimensions and their 30 facets, and analyzing item responses from more than 20,000 individuals that had completed the 300-item IPIP-NEO, he identified the items with

the highest item-total correlations for each facet scale. This process, together with efforts to reduce redundancy, ensure content breadth similar to Costa and McCrae's NEO-PI-R, and avoid potential legal problems (e.g. items measuring religious beliefs) resulted in the selection of four items per facet scale; 120 items in total. Comparing this shorter inventory to the full IPIP-NEO and the NEO-PI-R, Johnson found that both the five broad domain scales and the 30 facet scales of the IPIP-NEO-120 had satisfactory reliability and validity (Johnson, 2014). The IPIP-NEO-120 seems to be able to capture both the broader FFM domains and the specifics of the facets. And its shorter format makes it more applicable in a number of research settings, such as those that rely on voluntary participation with little to offer in return for the participants' time, or research relying on hard-to-reach or vulnerable participants.

A key principle of IPIP is that researchers (and others) are free to copy, edit, translate, and use IPIP items. As a result of this principle, the IPIP items have been translated into a large number of languages, and IPIP scales and inventories globally serve as free alternatives to commercial ones. Furthermore, when entire scales are translated, results from research across countries and languages can be compared. Hartmann has previously adapted IPIP-NEO items to construct a Danish 120-item five-factor questionnaire (the Danish International Personality Item Pool Questionnaire; Hartmann & Friis, 2005). However, the purpose of Hartmann's work was not to construct a translation of the IPIP-NEO or the IPIP-NEO-120, and the questionnaire therefore includes newly written items that do not correspond to any IPIP items. Though useful for measuring the FFM dimensions, Hartmann's questionnaire is not a Danish IPIP-NEO-120. We wish to provide Danish researchers with just that: a free personality inventory measuring the FFM dimensions and their facets with the additional advantage of being a faithful translation of a well-validated five-factor questionnaire; a Danish IPIP-NEO-120.

Since the commercial Danish five-factor measures cannot be used in conjunction with potentially competing measures, and no open-source alternatives have been developed before now, the present study did not include an additional five-factor measure to compare the Danish IPIP-NEO-120 with. However, academic self-efficacy, academic satisfaction, and Grade Point Average (GPA) were measured. These variables and the FFM dimensions have a distinctive correlational pattern: Conscientiousness is generally positively associated with GPA (e.g. Poropat, 2009; Vedel, 2014); academic self-efficacy is generally positively associated with Conscientiousness and Extraversion and negatively associated with Neuroticism (e.g. McIlroy, Poole, Ursavas, & Moriarty, 2015); and academic satisfaction is generally positively associated with Extraversion and negatively associated with Neuroticism (e.g. Sheu, Mejia, Rigali-Oiler, Primé, & Chong, 2016). A replication of this correlational pattern in the present study would support the construct validity of the dimensions measured with the Danish IPIP-NEO-120.

## **2. Method**

### **2.1. Participants**

Participants were 493 students from a veterinary department at a Danish university and 32 graduates who had graduated from the veterinary program within less than a year and a half. The majority of the students ( $n = 328$ ; 67%) were undergraduates. The age of the participants ranged from 20 to 56 years (mean age = 25.54,  $SD = 4.13$ ), and a majority was female ( $n = 477$ ; 91%).

## 2.2. Measures

### 2.2.1. IPIP-NEO-120

The IPIP-NEO-120 used in this study measured the FFM dimensions and their subordinate facets with 120 items. As in the original instrument (Johnson, 2014), general personality-relevant statements were self-rated on a 5-point Likert scale ranging from 1 (*very inaccurate*) to 5 (*very accurate*). In the American Eugene-Springfield Community Sample ( $N = 501$ ) used by Johnson (2014) to validate the English-language IPIP-NEO-120, Cronbach's  $\alpha$  for each of the five domain scales were .88 for Neuroticism ( $\alpha$ 's for the facet scales ranged from .63 to .80), .84 for Extraversion ( $\alpha$ 's for the facet scales ranged from .60 to .77), .85 for Openness ( $\alpha$ 's for the facet scales ranged from .66 to .78), .81 for Agreeableness ( $\alpha$ 's for the facet scales ranged from .56 to .70), and .84 for Conscientiousness ( $\alpha$ 's for the facet scales ranged from .47 to .76). In the two large internet samples ( $N = 307,313$  and  $N = 619,150$ ) also used by Johnson (2014) for further validation of the IPIP-NEO-120, even higher alphas were found for some of the FFM dimensions and facets. Coefficient alphas for the domain scales and facet scales in the present study are presented in Table 1.

### 2.2.2. Academic Self-Efficacy Scale

The Danish version (Vedel & Thomsen, 2018) of the Academic Self-Efficacy Scale originally developed by Chemers, Hu, and Garcia (2001) was used in the present study to measure academic self-efficacy. The scale consists of 8 items rated on a 7-point Likert scale (ranging from *very untrue* to *very true*), and participants rate their agreement with statements reflecting their confidence in their ability to perform well academically as well as their confidence in their academic skills, such as test taking, scheduling of tasks, etc. In the study by Chemers, Hu, and Garcia (2001) Cronbach's  $\alpha$  was .81, and in the Danish study by Vedel and Thomsen (2018)  $\alpha$  was .84. In the present study Cronbach's  $\alpha$  was .78.

### 2.2.3. *Academic Satisfaction Scale*

The Danish version (Vedel & Thomsen, 2018) of the Academic Satisfaction Scale originally developed by Lent et al. (2005) was used in the present study to measure academic satisfaction. The scale consists of 7 items rated on a 5-point Likert scale (ranging from *strongly disagree* to *strongly agree*), and participants rate their agreement with statements reflecting their satisfaction with various aspects of their academic experience, such as coursework, the academic atmosphere, the level of intellectual stimulation, etc. In the study by Lent et al. (2005) Cronbach's  $\alpha$  was .87, and in the Danish study by Vedel and Thomsen (2018)  $\alpha$  was .88. In the present study Cronbach's  $\alpha$  was .73.

## 2.3. *Procedure*

### 2.3.1. *Translation*

First, a personality psychologist and an English expert translated the items of the IPIP-NEO-120 into Danish independently. Then these translations were back-translated independently by another personality psychologist and another English expert. Only minor differences between the back-translations and the original IPIP-NEO-120 emerged. The small divergences were discussed, and a final Danish version of the IPIP-NEO-120 was formulated (available from the first and second author). To avoid potential legal problems with collecting data on voting behavior, the formulation of two Openness items was altered slightly. The item "Tend to vote for liberal political candidates" was altered into "View myself as predominantly liberal politically", and the item "Tend to vote for conservative political candidates" was altered into "View myself as predominantly conservative politically". Also, the Conscientiousness item "Leave a mess in my room" was altered to "Leave a mess at home", acknowledging that participants may have different types of accommodation. None of



these alterations changed the meaning of the items, and we did not expect them to affect the results.

### *2.3.2. Recruitment*

The study was approved by the Danish Data Protection Agency, and the participants were recruited in cooperation with the administrative staff of the Student and Career Guidance unit. A welcome email was sent to all veterinary students and newly graduated veterinarians inviting them to participate in a study by use of individualized links to an electronic questionnaire. Students and graduates who consented to the study and completed the questionnaire participated in a prize draw for 5 gift vouchers worth US\$160 to an academic bookshop. Additionally, a standard personality profile was provided upon request. The present study was part of a larger research project, and the questionnaire measured other constructs than personality traits, such as academic self-efficacy, career aspirations, academic satisfaction, GPA, and well-being.

## **3. Results**

### *3.1. Factor structure*

First, we conducted a principal component analysis (PCA) with varimax rotation using IBM's SPSS 24, extracting five factors to investigate the expected five-factor structure of the 120 IPIP items in our sample. The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis,  $KMO = .87$ , and Bartlett's test was significant ( $\chi^2(7,140) = 31,130.24, p < .001$ ), indicating an underlying factor structure. A scree plot of the first 15 eigenvalues is presented in Figure 1. The curve tailed off after the sixth data point, suggesting the extraction of five factors. The five factors explained 33% of the total variance.

[Figure 1 near here]

Of the 120 items, 100 (83%) loaded .3 or above on the expected factor (the factor loadings are provided in Appendix 1). To investigate whether this is comparable to the loadings in the original IPIP-NEO-120, we downloaded Johnson's largest dataset ( $N = 619,150$ ) from his IPIP-NEO data repository on the Open Science Framework (<https://osf.io/tbmh5/>) and conducted an identical principal component analysis using this dataset. This analysis showed that 105 (88%) of the 120 items loaded .3 or above on the expected factor; slightly more than in the Danish measure. However, a closer look at the loadings in the Danish measure showed that many of the items loaded almost .30, and the number of items loading .25 or above on the expected factor was identical in the analysis using Johnson's data and in the analysis using our data; 109 (91%). Moreover, the same items that loaded below .30 on the expected factor and loaded substantially on other factors in the Danish measure generally showed the same pattern in the original measure, and vice versa. The item "Find it difficult to approach others", for example, measuring the Neuroticism facet of Self-consciousness, had negative loadings above .5 on the Extraversion factor in both analyses, which is not very surprising given its social-assertive content.

For Neuroticism, 18 of the 24 items loaded .3 or above on the same factor (Factor 1). All items in the Anxiety, Anger, Depression and Vulnerability facets loaded as expected. Though also loading on the Neuroticism factor, the items in the Self-consciousness facet loaded more on the factor shared with the Extraversion items, and three of the four items on the Immoderation facet loaded more on other factors, but with no general pattern.

For Extraversion, 22 of the 24 items loaded .3 or above on the same factor (Factor II). One item in the Assertiveness facet loaded .28 on the Extraversion factor and had a substantial cross-loading on the Conscientiousness factor, and one item in the Activity Level facet ("Like to take it easy") did not load strongly on any factor. The items in the Friendliness and Gregariousness facets had only minor loadings on other factors, whereas some items in

the facets of Assertiveness, Excitement Seeking, and Cheerfulness had substantial cross-loadings.

For Conscientiousness, 22 of the 24 items loaded .3 or above on the same factor (Factor III). One item in the Dutifulness facet loaded .25 on the Conscientiousness factor, and one item in the Cautiousness facet (“Rush into things”) loaded less than .1 on this factor and had its highest loading on the Extraversion factor.

For Openness, 19 of the 24 items loaded .3 or above on the same factor (Factor IV). Three items in the Emotionality facet loaded somewhat lower on the Openness factor (between .21 and .28); two of them slightly higher on the factor shared with the Neuroticism items. And two items in the Liberalism facet loaded .25 and .26 on the Openness factor and did not load strongly on other factors.

For Agreeableness, 19 of the 24 items loaded .3 or above on the same factor (Factor V). One item in the Trust facet loaded .26 on the Agreeableness factor and loaded more on the Neuroticism and Extraversion factors. Two items in the Morality facet loaded .27 and .20 on the Agreeableness factor and did not load strongly on other factors. One item in the Modesty facet (“Have a high opinion of myself”) loaded primarily on the Neuroticism factor and less on the Agreeableness factor (.18), and one item in the Sympathy facet (“Try not to think about the needy”) loaded primarily on the Openness factor and less on the Agreeableness factor (.19).

In terms of the factor component loadings of the facet scales in the Danish measure (provided in Appendix 2), these corresponded well to the factor component loadings of the facet scales in Johnson’s (2014) original measure. As in Johnson’s original measure, the majority of the facet scales had their highest loading on the expected factor (20 in Johnson’s original measure; 19 in the Danish measure), and the facet scales that had their highest loading on another factor were generally the same in the two measures.

### **3.2. Internal consistency**

We calculated the internal consistency reliabilities of the five factors and the 30 facets. These are reported in Table 1. As in the original IPIP-NEO-120, the internal consistency estimates for the factors were high, ranging from .75 to .89. For the facets, the internal consistency reliabilities fell somewhere between the alphas obtained in the Eugene-Springfield sample and the ones obtained in the large internet samples also used to validate the IPIP-NEO-120 (see Johnson, 2014). 17 of the 30 facets had reliabilities above .70, and 9 had reliabilities between .60 and .70. Four facets had reliabilities below .60, which would have indicated poor internal consistency if the scales had many items. However, the facet scales consist of only four items each, and alphas below .60 may therefore not automatically reflect internal consistency issues. The number of items in a scale affects coefficient alpha profoundly, favoring longer scales (Cortina, 1993), and one should therefore evaluate the internal consistency of scales, especially shorter ones, using mean inter-item correlations also (Clark & Watson, 1995). For this reason, mean inter-item correlations for the facet scales were calculated, and they too are reported in Table 1. Different guidelines for the evaluation of mean inter-item correlations exist, balancing consistency with redundancy: Clark and Watson (1995), for example, have recommended mean inter-item correlations in the range of .15 to .50, while Briggs and Cheek (1986) have recommended the range of .20 to .40. Robinson, Shaver, and Wrightsman (1991), on the other hand, do not specify an upper limit, but simply recommend mean inter-item correlations above .30. None of the facets had mean inter-item correlations that did not reach the lower boundary of the first two guidelines, and only five facets had mean inter-item correlations below .30. Consequently, the mean inter-item correlations showed that the internal consistency was satisfactory for the facet scales also.

[Table 1 near here]

### ***3.3. Factor intercorrelations***

To examine the relationships among the five factors in the Danish IPIP-NEO-120, we conducted a series of bivariate Pearson correlations. The correlations from these analyses are reported in Table 2 above the diagonal. To investigate whether these were comparable to the correlations among the five factors in the original IPIP-NEO-120, we conducted the same correlation analyses using Johnson's dataset. The correlations from these analyses are reported in Table 2 below the diagonal. Overall, the correlations in the Danish measure corresponded to the correlations in the original measure, the strongest correlation being the negative one between Neuroticism and Extraversion.

[Table 2 near here]

### ***3.4. Factor correlations with academic self-efficacy, academic satisfaction, and GPA***

To examine the relationships between the five factors in the Danish IPIP-NEO-120 and academic self-efficacy, academic satisfaction, and GPA, we conducted a series of bivariate Pearson correlations. The results are reported in Table 3, and the correlations conformed to the expected pattern found in previous research: Conscientiousness was positively associated with GPA, and academic self-efficacy and academic satisfaction were positively associated with Conscientiousness and Extraversion and negatively associated with Neuroticism.

[Table 3 near here]

### ***3.5. Descriptive statistics***

Means and standard deviations for the Danish sample are provided in Table 4. The mean scores and standard deviations obtained with the Danish IPIP-NEO-120 scales closely resembled those of the large internet sample in Johnson's dataset for Neuroticism, Extraversion, Openness, and Conscientiousness. The Agreeableness mean score, though, was

somewhat higher in the Danish sample ( $M = 97.0$ ) than in Johnson's sample ( $M = 87.8$ ) and also had a smaller standard deviation ( $SD = 8.7$  vs.  $SD = 12.5$ ).

[Table 4 near here]

#### **4. Discussion**

The purpose of the present study was to validate the Danish IPIP-NEO-120. The results showed that the Danish IPIP-NEO-120 has psychometric properties highly comparable to those of the original measure in terms of factor structure, internal consistency, and factor intercorrelations. Some items loaded on one or more unintended factors. However, this is not surprising given the similar cross-loadings in Johnson's sample and, more generally, the nontrivial intercorrelations among the FFM dimensions consistently found in the research literature (van der Linden, te Nijenhuis, & Bakker, 2010) and also in the present study. As in Johnson's (2014) validation study, the highest intercorrelation among the FFM dimensions was the negative one between Neuroticism and Extraversion, possibly reflecting the somewhat inverse emotional and behavioral content of these two dimensions (Steel, Schmidt, & Shultz, 2008). Moreover, in the development of the IPIP-NEO-120, Johnson (2014) did not select items based solely on their psychometric qualities; he also examined the content of the items and ensured that the items selected were closely aligned conceptually with the NEO-PI-R items. Furthermore, he aimed to minimize repetitiveness. This illustrates how scale construction typically involves balancing different strategies in the search for the best selection of items (for a review of different strategies of scale construction, see Goldberg, 1972).

The correlational pattern between the FFM dimensions and the academic and sociocognitive variables of GPA, academic self-efficacy, and academic satisfaction found in the present study is consistent with findings from previous research (e.g. McIlroy et al., 2015; Poropat, 2009; Sheu et al., 2016). This supports the construct validity of the dimensions

measured in the Danish IPIP-NEO-120. Conscientiousness, Extraversion, and Neuroticism appear to be the main FFM dimensions involved in students' perceptions of their academic life and their ability to perform academically, and Conscientiousness is also positively associated with actual academic performance in terms of grades.

In regard to the mean scores obtained in this first Danish sample, it is important to keep in mind that this was a sample of veterinary students (and graduates) and not a sample representative of the Danish population as such. There was a high percentage of women in the sample (91%), and since women on average score higher than men on Agreeableness (Costa, Terracciano, & McCrae, 2001; Schmitt, Realo, Voracek, & Allik, 2008), this is most likely why we found a higher Agreeableness score here than in Johnson's sample, which had comparatively fewer women (60%). Research has also shown that students in different majors differ on the FFM dimensions (for a review, see Vedel, 2016). On Agreeableness, medicine, psychology, and sciences students generally score higher than business, economics, and law students. As veterinary medicine is closer to the first group of majors than to the second, this may also help explain why we saw the high average score on Agreeableness. Future research on the Danish IPIP-NEO-120 employing more diverse samples should be pursued, as should research using non-self-report data, such as other-reports, observational or experimental data.

## **5. Conclusion**

As research using personality inventories burgeons, researchers are in need of freely available and validated measures applicable across countries. This study provided evidence supporting the reliability and validity of the Danish IPIP-NEO-120 and showed that this instrument appears to be highly comparable to Johnson's original measure. Danish researchers interested in measuring the FFM dimensions now have a free alternative to the

commercial five-factor measures. Hopefully, this will encourage and enable more Danish researchers to include personality traits in their studies.

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## Appendix 1

Five-factor varimax-rotated loadings of the Danish IPIP-NEO-120 items

Item no.	Components				
	I (N)	II (E)	III (C)	IV (O)	V (A)
1	<b>.71*</b>				.14
6	<b>.50*</b>				<b>-.44</b>
11	<b>.69*</b>	-.27	-.14		
16	.23	<b>-.54*</b>	-.15		
21	.20	.25*	-.22		-.25
26	<b>.60*</b>			-.19	
31	<b>.68*</b>	-.19			
36	<b>.54*</b>				<b>-.34</b>
41	<b>.58*</b>	-.25	-.21		
46	<b>.31</b>	<b>-.41*</b>	-.11		.22
51	.21	.19	<b>-.38*</b>		
56	<b>.46*</b>	-.25			
61	<b>.55*</b>	-.25	-.13		
66	<b>.51*</b>		-.12		<b>-.36</b>
71	<b>.71*</b>	-.28	-.19		
76	.15	-.20*	-.16		
81	.16	.24*	-.21		-.15
86	<b>.54*</b>	<b>-.32</b>	<b>-.30</b>		
91	<b>.66*</b>	-.15	-.13		.14
96	<b>.50*</b>				<b>-.31</b>
101	<b>.62*</b>	<b>-.34</b>	-.21		
106	.10	<b>-.52*</b>		-.19	
111	<b>.35*</b>		-.29		-.20
116	<b>.47*</b>	-.13	-.14	-.22	
2	-.24	<b>.65*</b>			
7		<b>.65*</b>	-.14		
12		<b>.43*</b>	<b>.36</b>	.14	<b>-.36</b>
17	.24	<b>.39*</b>			
22	-.17	<b>.48*</b>		.25	-.20
27	<b>-.30</b>	<b>.50*</b>	.12		.20

32	<b>-.37</b>	<b>.59*</b>	.11		.17
37	-.15	<b>.67*</b>			
42		<b>.35</b>	<b>.30</b>	.15	<b>-.38*</b>
47		<b>.43*</b>	.24		-.12
52		<b>.38</b>		<b>.42*</b>	-.15
57	<b>-.38</b>	<b>.58*</b>			
62	-.29	<b>.60*</b>	.15		.15
67	-.21	<b>.54*</b>			.11
72		<b>.37</b>	<b>.40</b>		<b>-.42*</b>
77	-.20	<b>.50*</b>	.11		-.13
82		<b>.50*</b>	-.13	<b>.32</b>	-.27
87	<b>-.46*</b>	<b>.43</b>	.15		
92	<b>-.33</b>	<b>.55*</b>	.16		.23
97	-.23	<b>.52*</b>			
102	-.18	.28	<b>.42*</b>	.16	-.19
107			.12*		
112		<b>.58*</b>	-.19	.17	-.29
117	<b>-.55*</b>	<b>.30</b>			
5	-.21	.21	<b>.54*</b>		
10			<b>.43*</b>	-.11	
15			<b>.45*</b>		.20
20	.13		<b>.55*</b>	.11	
25			<b>.58*</b>		.14
30		<b>-.39*</b>	<b>.37</b>	-.21	<b>.32</b>
35	-.15	.17	<b>.58*</b>	.13	-.11
40			<b>.50*</b>	-.15	
45		.12	.25*		.22
50	.13	.23	<b>.56*</b>		
55	-.19	<b>.32</b>	<b>.46*</b>		
60	-.20	-.26	<b>.41*</b>	-.13	.26
65	<b>-.30</b>		<b>.33*</b>	.16	-.21
70			<b>.51*</b>	-.14	
75		-.22	<b>.30</b>	-.28	<b>.34*</b>
80			<b>.48*</b>		.19
85	-.25	.23	<b>.44*</b>	-.21	.13
90	.17	<b>-.52*</b>		<b>-.32</b>	.20

95	-.23	.15	<b>.52*</b>	.13	-.16
100		-.13	<b>.49*</b>	-.15	
105			<b>.41*</b>		.25
110			<b>.32*</b>		
115	-.23	.10	<b>.56*</b>		
120	-.15	<b>-.30</b>	<b>.44*</b>		.29
3			-.12	<b>.53*</b>	-.12
8				<b>.45*</b>	
13	<b>.55*</b>		.12	.28	
18	-.14	.18		<b>.33*</b>	-.11
23		-.12	.23	<b>.41*</b>	
28	.10			<b>.43*</b>	.14
33	.10		-.27	<b>.53*</b>	-.15
38				<b>.60*</b>	
43	.16	.13	.25	<b>.32*</b>	.20
48	-.27	<b>.31</b>		<b>.40*</b>	-.15
53				<b>.51*</b>	
58			-.18	<b>.25*</b>	
63			-.25	<b>.52*</b>	
68				<b>.49*</b>	.18
73	.12		.26	<b>.27*</b>	.19
78	<b>-.33*</b>	.28		<b>.32</b>	
83	-.12		.11	<b>.52*</b>	
88				<b>.38*</b>	.15
93			-.19	<b>.52*</b>	
98	-.13			<b>.50*</b>	
103	<b>.34*</b>		.15	.21	.26
108		.16		<b>.40*</b>	
113			.18	<b>.42*</b>	
118			-.19	<b>.26*</b>	
4	<b>-.30</b>	<b>.42*</b>			<b>.35</b>
9	.10	-.25	.18		<b>.27*</b>
14	<b>.38</b>	.24	.18	.14	<b>.40*</b>
19		-.18		-.15	<b>.35*</b>
24	.11		-.24		<b>.50*</b>
29	.16			<b>.42*</b>	<b>.31</b>

34	<b>-.39</b>	<b>.41*</b>		-.12	.26
39			.23*		.20
44	.15	.26		.23	<b>.31*</b>
49	<b>-.35</b>	.14			<b>.40*</b>
54	<b>.36</b>	-.24	-.17	-.12	<b>.38*</b>
59	.11			<b>.34</b>	<b>.44*</b>
64	-.20	<b>.34</b>		-.14	<b>.38*</b>
69			.16		<b>.43*</b>
74	.12	.10	.13	.20	<b>.47*</b>
79	-.14		.14		<b>.50*</b>
84	<b>.55*</b>	-.27	-.11		.18
89	.12	.22	.18	.20	<b>.39*</b>
94	<b>-.41*</b>	<b>.34</b>			<b>.36</b>
99	-.10		.18	.13	<b>.39*</b>
104	.19	.22	.17	.28	<b>.41*</b>
109	-.10				<b>.39*</b>
114		-.22			<b>.40*</b>
119			.11	<b>.31*</b>	.19

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*Note.* Loadings of .30 or above are shown in bold. Loadings below .10 are not displayed. The highest factor loading for each item is indicated with an asterisk. N = Neuroticism; E = Extraversion; C = Conscientiousness; O = Openness; A = Agreeableness.

## Appendix 2

## Factor component loadings of the 30 Danish IPIP-NEO-120 facet scales

Scale		Components				
		I (N)	II (E)	III (C)	IV (O)	V (A)
<i>Neuroticism</i>						
Anxiety	N1	<b>-.74*</b>	.05	-.14	-.12	.39
Anger	N2	<b>-.64*</b>	<b>.41</b>	.11	-.11	-.02
Depression	N3	<b>-.77*</b>	.09	-.26	.02	.28
Self-consciousness	N4	<b>-.56*</b>	-.36	-.25	-.10	-.07
Immoderation	N5	-.14	<b>.50*</b>	-.27	-.06	.06
Vulnerability	N6	<b>-.68*</b>	.03	-.25	-.18	.25
<i>Extraversion</i>						
Friendliness	E1	<b>.77*</b>	.23	.21	-.09	.20
Gregariousness	E2	<b>.65*</b>	<b>.45</b>	.05	-.06	.18
Assertiveness	E3	.24	<b>.40</b>	<b>.57*</b>	.11	-.09
Activity level	E4	.29	<b>.38*</b>	.27	-.20	.16
Excitement-seek.	E5	.36	<b>.66*</b>	.02	.25	.03
Cheerfulness	E6	<b>.77*</b>	.11	.17	.03	-.01
<i>Conscientiousness</i>						
Self-efficacy	C1	.30	-.01	<b>.71*</b>	.16	-.12
Orderliness	C2	.02	-.27	<b>.50*</b>	-.15	.03
Dutifulness	C3	.06	<b>-.47*</b>	<b>.40</b>	-.20	.29
Achievement-striv.	C4	.03	-.09	<b>.67*</b>	.00	.25
Self-discipline	C5	.32	-.17	<b>.69*</b>	-.16	.10
Cautiousness	C6	-.14	<b>-.69*</b>	.22	-.16	-.00
<i>Openness</i>						
Imagination	O1	-.12	.24	-.18	<b>.56*</b>	.04
Artistic interests	O2	.05	-.01	-.00	<b>.70*</b>	.11
Emotionality	O3	-.26	.03	.23	.26	<b>.56*</b>
Adventurousness	O4	.37	.30	.04	<b>.43*</b>	.03
Intellect	O5	.02	-.01	.23	<b>.74*</b>	.03
Liberalism	O6	.02	.03	-.19	<b>.49*</b>	.22
<i>Agreeableness</i>						



Scale		Components				
		I (N)	II (E)	III (C)	IV (O)	V (A)
Trust	A1	<b>.68*</b>	-.10	-.03	-.13	.18
Morality	A2	-.01	<b>-.48*</b>	.14	.03	.34
Altruism	A3	.09	-.03	.10	.17	<b>.77*</b>
Cooperation	A4	.25	<b>-.61*</b>	-.14	-.09	.30
Modesty	A5	-.31	-.31	-.32	-.18	<b>.46*</b>
Sympathy	A6	.12	-.11	.05	<b>.42</b>	<b>.62*</b>

*Note.* Loadings of .40 or above are shown in bold. The highest factor component loading for each facet scale is indicated with an asterisk. N = Neuroticism; E = Extraversion; C = Conscientiousness; O = Openness; A = Agreeableness.

Table 1

Coefficient alphas for the five factors and 30 facets and mean inter-item correlations for the facets of the Danish IPIP-NEO-120.

Domain and facet scales	Coefficient alphas	Mean inter-item $r$ 's
<b>Neuroticism</b>	<b>.89</b>	
N1: Anxiety	.78	.47
N2: Anger	.82	.53
N3: Depression	.87	.62
N4: Self-consciousness	.64	.30
N5: Immoderation	.71	.38
N6: Vulnerability	.72	.40
<b>Extraversion</b>	<b>.89</b>	
E1: Friendliness	.80	.52
E2: Gregariousness	.76	.44
E3: Assertiveness	.83	.55
E4: Activity Level	.66	.32
E5: Excitement-seeking	.78	.47
E6: Cheerfulness	.79	.48
<b>Openness</b>	<b>.81</b>	
O1: Imagination	.85	.58
O2: Artistic Interest	.74	.41
O3: Emotionality	.63	.30
O4: Adventurousness	.72	.39
O5: Intellect	.62	.29
O6: Liberalism	.65	.31
<b>Agreeableness</b>	<b>.75</b>	
A1: Trust	.84	.57
A2: Morality	.53	.24
A3: Altruism	.65	.33
A4: Cooperation	.48	.20
A5: Modesty	.69	.35
A6: Sympathy	.56	.25
<b>Conscientiousness</b>	<b>.85</b>	

C1: Self-efficacy	.73	.40
C2: Orderliness	.85	.58
C3: Dutifulness	.51	.25
C4: Achievement-striving	.65	.34
C5: Self-discipline	.67	.34
C6: Cautiousness	.76	.45

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*Note.* Factor coefficient alphas in boldface.

Table 2

Bivariate correlations among the five factors in the Danish IPIP-NEO-120 (above the diagonal) and in the original IPIP-NEO-120 (below the diagonal).

Scale	Neuroticism	Extraversion	Openness	Agreeableness	Conscientiousness
Neuroticism		-.58**	-.04	-.11**	-.33**
Extraversion	-.48**		.18**	-.02	.12**
Openness	-.04**	.15**		.11*	-.13**
Agreeableness	-.22**	.09**	.21**		.24**
Conscientiousness	-.45**	.22**	-.06**	.34**	

*Note.* \* =  $p < .05$ . \*\* =  $p < .01$ .

Table 3

Bivariate correlations between the five factors in the Danish IPIP-NEO-120 and academic self-efficacy, academic satisfaction, and GPA

Scale	Neuroticism	Extraversion	Openness	Agreeableness	Conscientiousness
Acad. self-effic.	-.36*	.33*	.06	.02	.49*
Acad. satisfact.	-.44*	.42*	.02	.05	.34*
GPA	-.04	.05	-.07	-.07	.23*

*Note.* \* =  $p < .01$ .

Table 4

Means and standard deviations for the Danish sample.

Scale	Mean (SD)
Neuroticism	66.0 (15.7)
Extraversion	83.5 (14.0)
Openness	80.1 (12.1)
Agreeableness	97.0 (8.7)
Conscientiousness	88.9 (12.0)
GPA	6.7 (2.3)
Acad. self-efficacy	29.7 (5.2)
Acad. satisfaction	29.1 (4.1)

Figure 1

Scree plot of the first 15 eigenvalues.

(see separate file)